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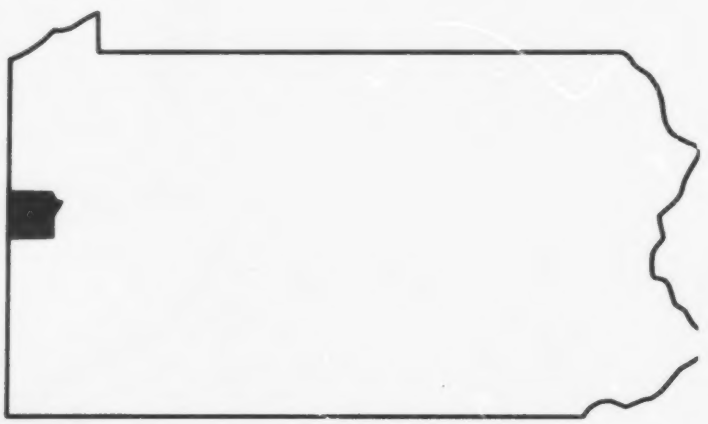
FLOOD INSURANCE STUDY

TOWN OF NORTH BEAVER, PENNSYLVANIA
LAWRENCE COUNTY



AUGUST 19, 1987

Federal Emergency Management Agency

COMMUNITY NUMBER - 421795

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NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program (NFIP) have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study (FIS) may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

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FLOOD INSURANCE STUDY
TOWNSHIP OF NORTH BEAVER, LAWRENCE COUNTY, PENNSYLVANIA

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the Township of North Beaver, Lawrence County, Pennsylvania, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood risk data for various areas of the community that will be used to establish actuarial flood insurance rates and assist the community in its efforts to promote sound floodplain management. Minimum floodplain management requirements for participation in the National Flood Insurance Program (NFIP) are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the state (or other jurisdictional agency) will be able to explain them.

1.2 Authority and Acknowledgments

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were prepared by Michael Baker, Jr., Inc., for the Federal Emergency Management Agency (FEMA), during the preparation of the Flood Insurance Study for the City of New Castle. The work for the New Castle study was completed in February 1977.

1.3 Coordination

On June 17, 1986, the Township of North Beaver was notified by FEMA of the initiation of a Flood Insurance Study for the Township of North Beaver.

On September 30, 1986, a final Consultation and Coordination Officer's (CCO) meeting was held with representatives of FEMA and the township to review the results of the study.

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2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the Township of North Beaver, Lawrence County, Pennsylvania. The Borough of Bessemer and the area known as S.N.P.J., which lie within the corporate limits of North Beaver, are not included in this study. The area of study is shown on the Vicinity Map (Figure 1).

The Mahoning River was studied by detailed methods from its confluence with the Beaver and Shenango Rivers to approximately 3.2 miles upstream. The areas studied by detailed methods were selected with priority given to all known flood hazard areas and areas of projected development and proposed construction.

The following streams were studied by approximate methods: the remaining portions of the Mahoning River, the Beaver River, Hickory Run, Sugar Creek, Honey Creek, Edwards Run, Jenkins Run, and several unnamed tributaries. Approximate analyses were used to study those areas having a low development potential or minimal flood hazards. The scope and methods of study were proposed to, and agreed upon by, FEMA and the Township of North Beaver.

2.2 Community Description

The Township of North Beaver is located in Lawrence County in western Pennsylvania. It is bordered by the Township of Mahoning to the north; the Township of Union to the northeast; the Borough of New Castle, the City of West Pittsburgh, and the Township of Taylor to the east; the Township of New Beaver to the southeast; the Township of Little Beaver to the south; and the unincorporated areas of Mahoning County, Ohio, to the west.

Major streams in North Beaver include the Mahoning and Beaver Rivers, which have sporadically developed and populated floodplains. These streams form the community's eastern corporate limits.

North Beaver has a moist and temperate climate that is subject to maritime and continental air mass invasion (Reference 1). The yearly average temperature is approximately 50 degrees Farenheit (°F), and the total yearly precipitation is approximately 40 inches. The temperature during the winter months averages approximately 30°F and occasionally falls below 0°F. The summer temperature averages approximately 70°F and occasionally rises above 95°F. Precipitation is well distributed throughout the year.

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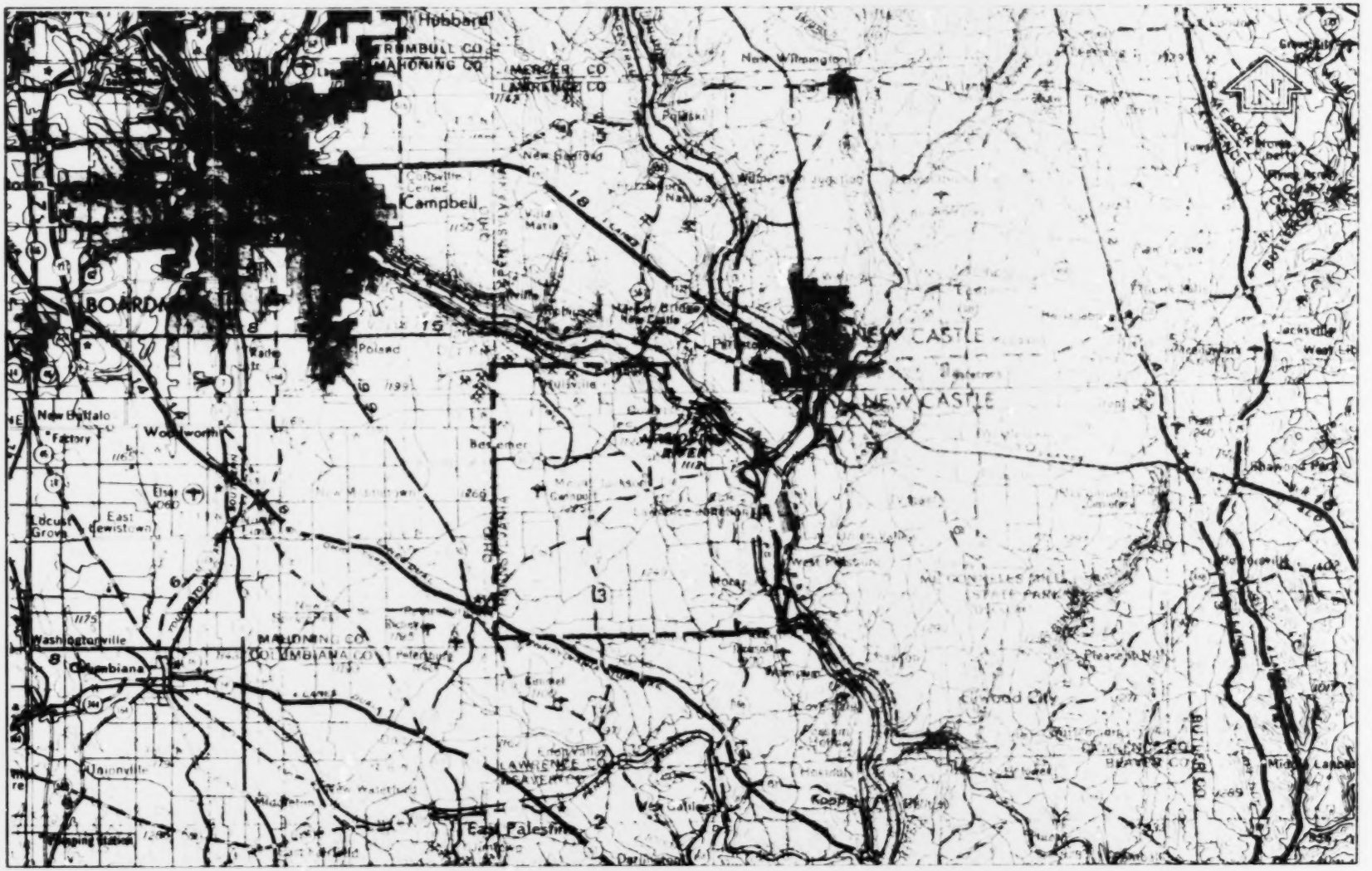

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF NORTH BEAVER, PA

(LAWRENCE CO.)

APPROXIMATE SCALE

4 0 4 8 12 MILES

VICINITY MAP

FIGURE 1

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The topography along the floodplain area is dominated by outwash, valley trains, river terraces, and ground moraine, which is characterized by a generally smooch to gently undulating topography. Elevations in North Beaver range from approximately 760 feet to 1,160 feet. The topography in the higher areas outside the floodplain are dominated by Kent End Moraine, Kames, Kame Terraces, Kame Moraines, and ground moraine, which is characterized by a knob and kettle topography. The landforms consist mainly of ridges, terraces, isolated mounds, and undrained depressions (Reference 2). The stratigraphy along the rivers and streams is noticeably different from that in the surrounding hills. The strata in both areas is of Pennsylvania Age; however, the strata along the rivers and streams consist primarily of sandstone and conglomerates with tin shales and coal, belonging to the Pottsville group, and the strata in the surrounding hills consist of cyclic sequences of sandstone, shale, limestone, and coal belonging to the Allegheny group (Reference 3).

The soils in North Beaver consist predominantly of three types: Urban Land, Ravenna, and Frenchtown. The Urban Land type is an alluvial material with a 0 to 8 percent slope and has a medium erodibility found along the streams. The Ravenna and Frenchtown soils are found in the hills surrounding the community. These soils are deep, somewhat poorly drained, and highly erodible and have a slow permeability and a seasonal high-water table. Vegetation through the area adjacent to the floodplains consists of sporadic wooded and open space areas.

2.3 Principal Flood Problems

The Township of North Beaver has experienced flooding from the Mahonig River. Debris and ice jams at bridges have caused extensive damage. The maximum flood of record occurred on March 26, 1913 (Reference 4). This flood has a recurrence interval of 200 years on the Mahoning River. Due to present reservoir conditions in the watershed, the chance of this flood occurring today is remote. A major flood also occurred on January 22, 1959, with a recurrence interval of 50 years on the Mahoning River. Other serious floods have occurred in 1910, 1911, 1929, 1936, 1937, 1942, 1952, 1956, 1959, and 1960.

2.4 Flood Protection Measures

The following reservoirs on the Mahoning River, owned by the United States Government and operated by the U. S. Army Corps of Engineers (COE), protect the river from floods: the Michael J. Kirwan Reservoir, Mosquito Creek Reservoir, Milton Reservoir, Berlin Reservoir, and Meander Creek Reservoir. None of these reservoirs are located within the Township of North Beaver. The Michael J. Kirwan Reservoir, which has been in operation since February 1967, is located in Portage County,

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Ohio, approximately 49 miles upstream of the township; it controls a drainage area of 80.5 square miles. The Mosquito Creek Reservoir has been in operation since April 1944 and is located in Trumball and Mahoning Counties, Ohio, approximately 33 miles upstream of the township; it controls a drainage area of 97.4 square miles. Milton Reservoir has been in operation since 1917 and is 48 miles above the township. The operation of Milton Reserovir has been coordinated with Berlin Reservoir, which is 55 miles above the township and has been in operation since July 1943. The Milton and Berlin Reservoirs control a combined drainage area of 276 square miles. Meander Creek Reservoir, in operation since 1931, is located approximately 26 miles upstream of the township and controls a drainage area of 86.5 square miles. These reservoirs cause approximately a 40 percent reduction of flow for a 100-year flood on the Mahoning River at Youngstown, Ohio.

3.0 ENGINEERING METHODS

For the flooding source studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude which are expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10, 2, 1, and 0.2 percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (1 percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for the flooding source studied in detail affecting the community.

Flood flow frequencies for the Mahoning River were obtained from the Flood Insurance Study for the City of New Castle (Reference 5). In that

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study, the COE supplied flood flow frequencies for stream flow recording gages in the area on the Mahoning River. This information was correlated with similar type watersheds to develop natural flow drainage area versus discharge relationships for floods of the selected recurrence intervals. Average reduction curves obtained from the Pittsburgh District of the COE were then used to correct the natural flood flows for the effects of the dams. The gages used as a basis for calculation were: the U. S. Geological Survey (USGS) gage No. 03995000 on the Mahoning River at Lowellville, Ohio, with a drainage area of 1,073 square miles and 32 years of record; and the USGS gage No. 03098000 on the Mahoning River at Youngstown, Ohio, with a drainage area of 898 square miles and 60 years of record.

A summary of the drainage area-peak discharge relationships for the Mahoning River is shown in Table 1, "Summary of Discharges."

TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
MAHONING RIVER					
At confluence with Beaver and Shenango Rivers	1,130.4	17,300	26,700	32,300	47,900

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the source studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals.

Cross sections for the backwater analyses of the Mahoning River were field surveyed and were located at close intervals above and below bridges and culverts in order to compute the significant backwater effects of these structures.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway was computed (Section 4.2), selected cross-section locations are also shown on the Flood Insurance Rate Map (Exhibit 2).

Water-surface elevations of floods of the selected recurrence intervals were computed using the COE HEC-2 step-backwater computer program (Reference 6). Flood profiles were drawn showing computed water-surface

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elevations for floods of the selected recurrence intervals. The starting water-surface elevations for the Mahoning River were determined by backwater analysis of the Beaver River.

Roughness coefficients (Manning's "n") for the Mahoning River were estimated by field inspection of the stream channel and overbank areas. The estimated "n" values were adjusted by the backwater elevations of known floods that were obtained from the COE. The channel "n" values for the Mahoning River ranged from 0.032 to 0.034, and the overbank "n" values ranged from 0.060 to 0.100.

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD). Elevation reference marks used in this study are shown on the maps; the descriptions of the marks are presented in Elevation Reference Marks (Exhibit 3).

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound floodplain management programs. Therefore, each Flood Insurance Study provides 100-year flood elevations and delineations of the 100- and 500-year floodplain boundaries and 100-year floodway to assist communities in developing floodplain management measures.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1 percent annual chance (100-year) flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2 percent annual chance (500-year) flood is employed to indicate additional areas of flood risk in the community. For the stream studied in detail, the 100- and 500-year floodplain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:24,000 with a contour interval of 20 feet (Reference 7).

For the streams studied by approximate methods, the boundary of the 100-year flood was delineated using the Flood Hazard Boundary Map for the Township of North Beaver (Reference 6).

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The 100- and 500-year floodplain boundaries are shown on the Flood Insurance Rate Map (Exhibit 2). On this map, the 100-year floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A and AE), and the 500-year floodplain boundary corresponds to the boundary of areas of moderate flood hazards. In cases where the 100- and 500-year floodplain boundaries are close together, only the 100-year floodplain boundary has been shown. Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 100-year floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment so that the 100-year flood can be carried without substantial increases in flood heights. Minimum federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced. The floodway in this study is presented to local agencies as a minimum standard that can be adopted directly or that can be used as a basis for additional floodway studies.

The floodway presented in this study was computed for certain stream segments on the basis of equal conveyance reduction from each side of the floodplain. Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. The results of the floodway computations are tabulated for selected cross sections (Table 2). The computed floodway is shown on the Flood Insurance Rate Map (Exhibit 2). In cases where the floodway and 100-year floodplain boundaries are either close together or collinear, only the floodway boundary is shown. Portions of the floodway widths for the Mahoning River extend beyond the corporate limits.

The area between the floodway and 100-year floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood by more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 2.

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FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH[2] (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Mahoning River								
A	1,510	312/182	4,645	8.4	777.3	777.3	778.3	1.0
B	2,160	327/127	4,653	8.2	777.9	777.9	778.9	1.0
C	2,980	368/184	5,122	7.2	779.1	779.1	779.8	0.7
D	4,030	518/58	8,988	4.4	780.6	780.6	781.1	0.5
E	5,210	772/72	8,789	4.9	780.8	780.8	781.3	0.5
F	6,085	894/34	8,496	5.6	780.9	780.9	781.5	0.6
G	8,900	195/105	4,317	7.5	781.5	781.5	782.5	1.0
H	9,655	934/816	9,017	6.0	782.4	782.4	783.3	0.9
I	10,330	1276/1126	12,003	4.4	782.9	782.9	783.8	0.9
J	11,300	1454/1334	13,686	4.2	783.2	783.2	784.1	0.9
K	12,430	1207/1087	11,136	5.2	783.4	783.4	784.4	1.0
L	13,380	1120/1000	10,215	5.6	783.7	783.7	784.7	1.0
M	14,450	912/742	10,334	3.9	784.4	784.4	785.4	1.0
N	15,900	335/195	4,688	8.9	784.7	784.7	785.6	0.9
O	16,620	365/155	6,081	5.3	785.8	785.8	786.8	1.0

[1]Feet above confluence with Beaver and Shenango Rivers
[2]Width/width within corporate limits

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWNSHIP OF NORTH BEAVER, PA

(LAWRENCE CO.)

FLOODWAY DATA

MAHONING RIVER

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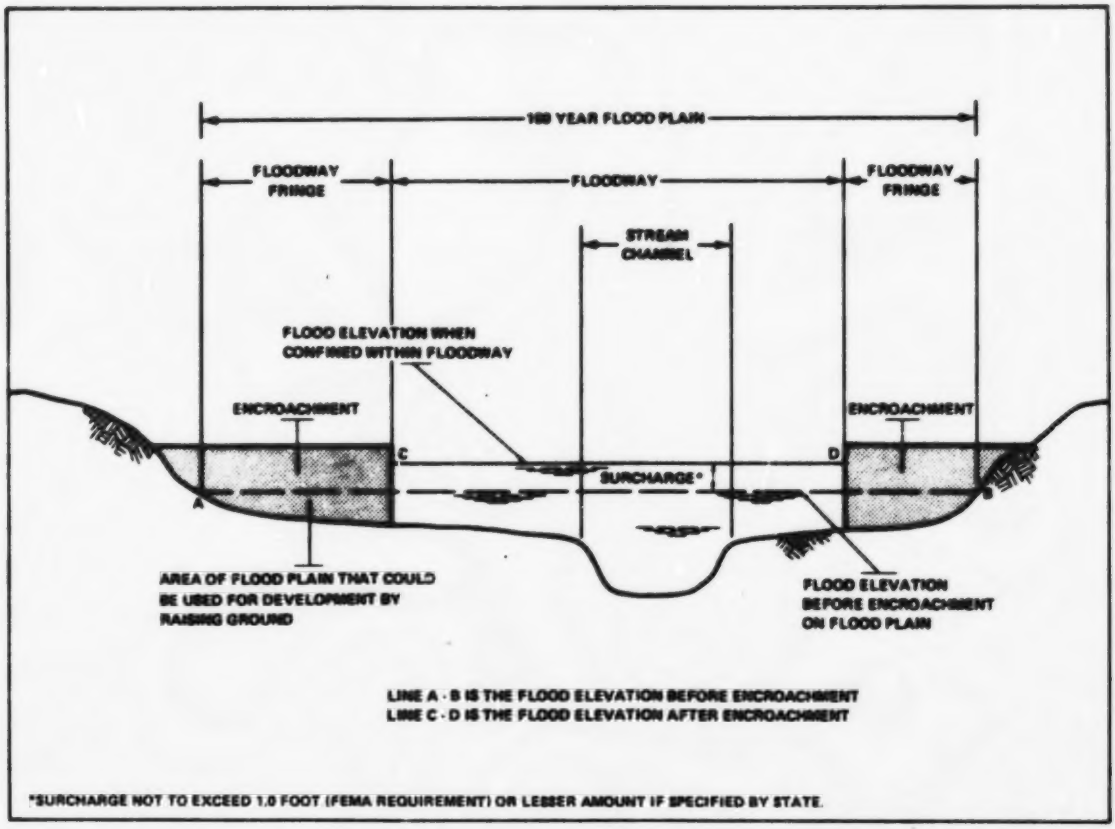
100 YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
SURCHARGE*
A
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE A - B IS THE FLOOD ELEVATION BEFORE ENCROACHMENT
LINE C - D IS THE FLOOD ELEVATION AFTER ENCROACHMENT
*SURCHARGE NOT TO EXCEED 1.0 FOOT (FEMA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE.

FLOODWAY SCHEMATIC Figure 2

5.0 INSURANCE APPLICATION

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. These zones are as follows:

Zone A

Zone A is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base flood elevations or depths are shown within this zone.

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Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by detailed methods. In most instances, whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AH

Zone AH is the flood insurance rate zone that corresponds to the areas of 100-year shallow flooding (usually areas of ponding) where average depths are between 1 and 3 feet. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AO

Zone AO is the flood insurance rate zone that corresponds to the areas of 100-year shallow flooding (usually sheet flow on sloping terrain) where average depths are between 1 and 3 feet. Average whole-foot depths derived from the detailed hydraulic analyses are shown within this zone.

Zone A99

Zone A99 is the flood insurance rate zone that corresponds to areas of the 100-year floodplain that will be protected by a Federal flood protection system where construction has reached specified statutory milestones. No base flood elevations or depths are shown within this zone.

Zone V

Zone V is the flood insurance rate zone that corresponds to the 100-year coastal floodplains that have additional hazards associated with storm waves. Because approximate hydraulic analyses are performed for such areas, no base flood elevations are shown within this zone.

Zone VE

Zone VE is the flood insurance rate zone that corresponds to the 100-year coastal floodplains that have additional hazards associated with storm waves. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

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Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 500-year floodplain, areas within the 500-year floodplain, and to areas of 100-year flooding where average depths are less than 1 foot, areas of 100-year flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 100-year flood by levees. No base flood elevations or depths are shown within this zone.

Zone D

Zone D is the flood insurance rate zone that corresponds to unstudied areas where flood hazards are undetermined, but possible.

6.0 FLOOD INSURANCE RATE MAP

The Flood Insurance Rate Map is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 100-year floodplains that were studied by detailed methods, shows selected whole-foot base flood elevations or average depths. Insurance agents use the zones and base flood elevations in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols, the 100- and 500-year floodplains. Floodways and the locations of selected cross sections used in the hydraulic analyses and floodway computations are shown where applicable.

7.0 OTHER STUDIES

The Pittsburgh District of the COE has completed a Flood Plain Information Study for the Lawrence County Regional Planning Commission (Reference 4). That study was completed in February 1965, which is before the completion of the West Branch Reservoir in the Mahoning River Basin and the Shenango Reservoir in the Shenango River Basin. Therefore, the flood elevations and discharges presented in this study are based on more-up-to date information and supersede those presented in the Flood Plain Information Study.

Flood Insurance Studies have been published for the Townships of Mahoning, Union, Taylor, New Beaver, and Little Beaver, the Borough of Bessemer, the City of New Castle, and the unincorporated areas of Mahoning County, Ohio (References 9, 10, 11, 12, 13, 14, 5, and 15). The results of this study is in complete agreement with the results of those studies.

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Due to its more detailed nature, this Flood Insurance Study supersedes the Flood Hazard Boundary Map for the Township of North Beaver (Reference 8).

8.0 LOCATION OF DATA

Information concerning the pertinent data used in preparation of this study can be obtained by contacting FEMA, the Natural and Technological Hazards Division, Liberty Square Building (Second Floor), 105 South Seventh Street, Philadelphia, Pennsylvania 19106.

9.0 BIBLIOGRAPHY AND REFERENCES

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11. Federal Emergency Management Agency, Flood Insurance Study, Township of Taylor, Lawrence County, Pennsylvania, Washington, D. C., August 3, 1984.

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EXHIBIT 3 - ELEVATION REFERENCE MARKS

Reference Mark	FIRM Panel	Elevation (Feet NGVD)	Description of Location
RM 1	10	782.40	Top of chiseled square cut in northwest corner of abutment wall, 12 inches below rail at CONRAIL bridge over the Mahoning River.
RM 2	10	792.56	Top of chiseled square cut on top of parapet wall at northwest corner of State Highway 18 over the Mahoning River, located approxiamtely 0.4 mile southwest along State Highway 18 from intersection of road to New Castle Sewage Disposal Plant and State Highway 18.

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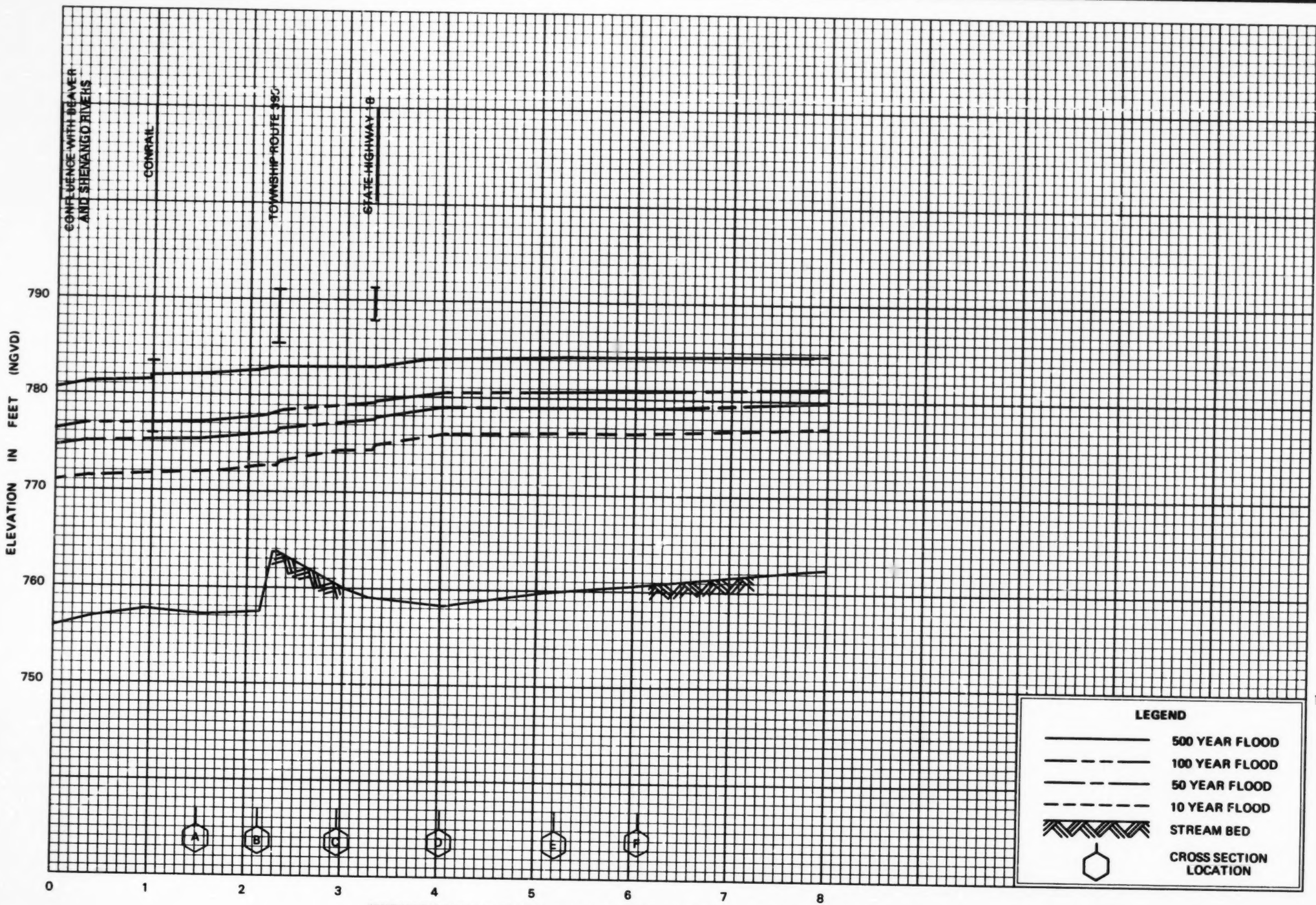

FLOOD PROFILES

MAHONING RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF NORTH BEAVER, PA

(LAWRENCE CO.)

01P

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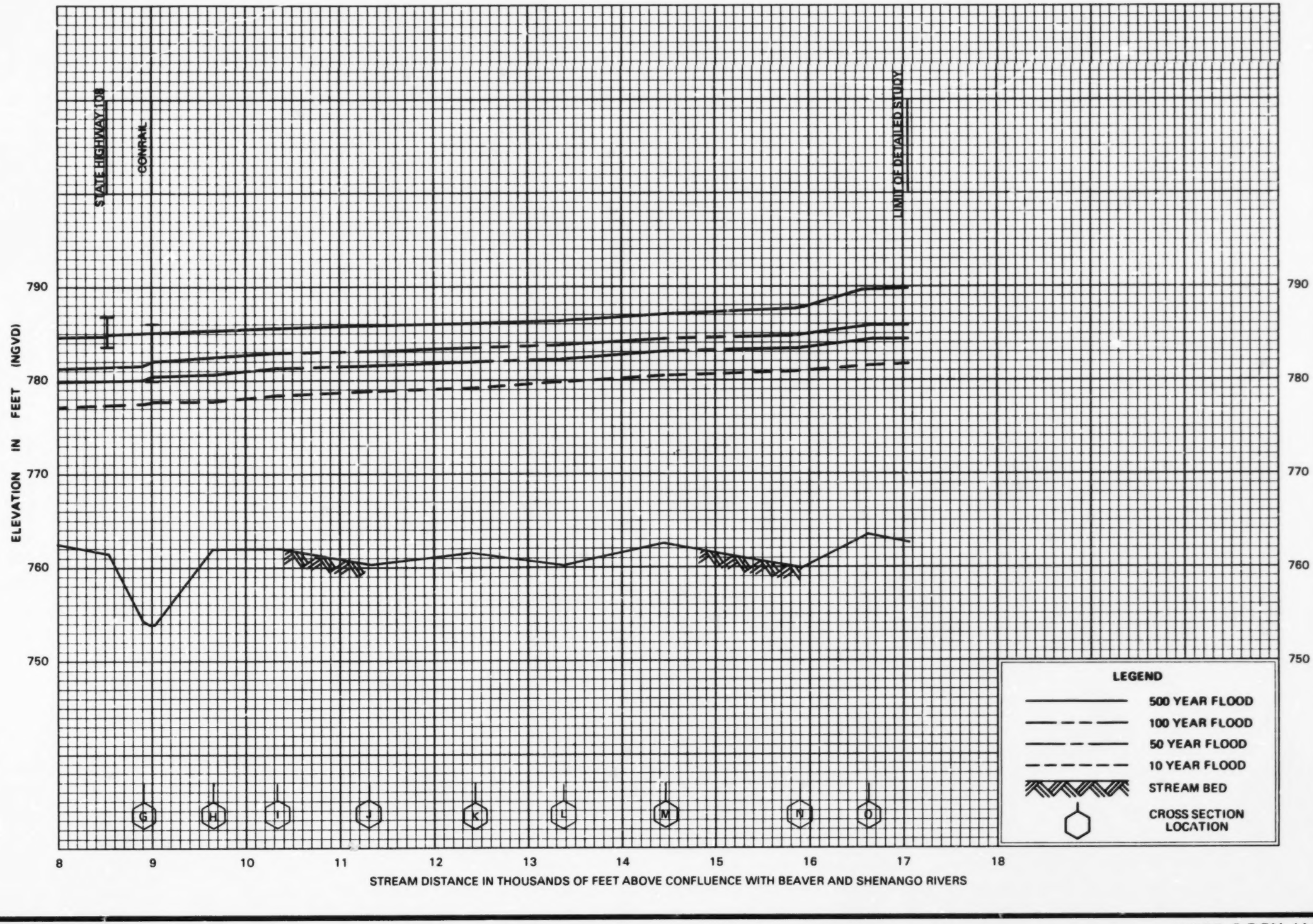

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